



## PATENT APPLICATION

### TITLE OF THE INVENTION

Electronic Method and System that Improves Efficiencies for Rendering Diagnosis of Radiology Procedures

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### CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 60/168,106 filed November 30, 1999. The subject matter of this application is incorporated by this reference.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable

### REFERENCE TO A "MICROFICHE APPENDIX"

Not applicable

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

The present invention relates to a method and apparatus for improving radiologists' efficiencies when viewing radiology procedures and rendering diagnosis.

#### 2. General Background of the Invention

Typically, every radiology office uses a dictating machine for the preparation of reports, a stack of master folders that contain patient information, and a light box, roto viewer, or like device for viewing radiology images. These images can include for example x-rays, ultrasound, magnetic resonance imaging (MRI), computer tomography, nuclear medicine images and the like.

The manual file folder system employed by radiologists and radiology departments is inefficient and cumbersome.

### BRIEF SUMMARY OF THE INVENTION

The present invention provides an electronic method of improving the efficiency of a radiologist and of a radiology department.

With the present invention, a plurality of computer monitors are provided for displaying various images. At least one of the monitors simulates a radiology "light box", roto viewer, or like device for displaying electronic radiology images.

At least one of the monitors is used to display a digital graphical representation of a patient's folder, namely a digital master folder.

A hyperlink is used to open the report and to open different "pages" of the patient's master folder.

In one embodiment, a voice activated command can be used to open the patient's master folder or to open "pages" of the patient's folder.

In another embodiment, a track ball device such as a computer mouse can be used to open the patient's master folder or "pages" contained within the folder.

In another embodiment, the radiologist/user is provided with a combination microphone/track ball device that enables the radiologist or user to open the patient's master folder or components thereof using either voice activated commands or the track ball device. A touch screen device hyperlink can also be used to open a patient's folder or report.

#### BRIEF DESCRIPTION OF THE DRAWINGS

For a further understanding of the nature, objects, and advantages of the present invention, reference should be had to the following detailed description, read in conjunction with the following drawings, wherein like reference numerals denote like elements and wherein:

Figure 1 is a screen capture image showing a patient's radiology master folder that displays basic patient information including name, number, and study date;

Figure 2 is a screen capture image showing the report, displayed by double clicking on the report hyperlink;

Figure 3 is a screen capture image showing the audio graphical display generated by the audio hyperlink 15;

Figure 4 is a screen capture image showing a modality subfolder generated by double clicking on the ultrasound header 17;

Figure 5 is a screen capture image that shows radiology images in twelve up format;

Figure 6 is a screen capture image that shows radiology images in four up format;

Figure 7 is a screen capture image that shows radiology images in cine mode;

Figure 8 is a screen capture image that shows a cine set display;

Figure 9 is a screen capture image that shows radiographic images, showing current chest x-rays views, on the two high resolution monitors with the roto viewer window displayed;

Figure 10 is a screen capture image that shows chest x-ray views current and most recent with the roto viewer window displayed;

Figure 11 is a screen capture image that shows radiographic images demonstrating picture zoom;

Figure 12 is a screen capture image showing radiographic images without the roto viewer; and

Figure 13 is a screen capture image showing multiple images using the roto viewer.

#### DETAILED DESCRIPTION OF THE INVENTION

Figure 1 shows a digital representation of a patient folder designated generally by the numeral 10. Patient folder 10 shows two hyperlinks 11, 12. At the top center of the folder 10, a header 17 indicates that this folder can, for example, relate to an ultrasound. The folder could relate to their radiology procedures. By clicking on the ultrasound hyperlink, the window shown in Figure 1 is opened providing a report display area 13 to be filled with the report information in text form as dictated by a radiologist.

When a radiologist double clicks on the report hyperlink 12 in Figure 1, the screen in Figure 2 is displayed which is the report screen 14 containing patient information and the substance of the report. Audio hyperlink 15 can be double clicked using the computer mouse in order to actually hear the report. When a user double clicks on the hyperlink 15 in Figure 2, the display in Figure 3 is shown on the screen having a graphical display for the audio.

When the radiologist double clicks on the ultrasound header 17 in Figure 1, the screen provided in Figure 4 has a modality subfolder 18 having a hyperlink 19. When the radiologist uses the computer mouse to double click on the exam hyperlink in Figure 4, actual radiology images as shown in Figure 5 are displayed.

In Figure 5, a left computer monitor 20 and a right computer monitor 21 are shown. In Figure 5, a "twelve up" configuration is shown in each of the monitors 20, 21. In Figure 6, a "four up" configuration is shown in each of the monitors 20, 21. In Figure 7, a cine mode is shown for each of the monitors 20, 21. In the cine mode, sets of images are grouped and maintained in that grouping on a selected screen 20 or 21. Figure 8 is a screen capture image that shows a cine set display.

Figures 9-12 show the use of the method and apparatus of the present invention to display full size radiology images, namely one image per screen 20, 21. In Figure 9, as an example, image 31 is a left image, current PA for a patient. The right image in Figure 9 is an image that is a current lateral for the patient. To the left hand side in the screen capture of Figure 9, a roto viewer 22 is also shown. The roto viewer in Figure 9 is comprised of two columns of boxes, each column containing a set of windows, each window can be designated by the numeral 25. The windows 25 can be scrolled to display various radiology images as further shown in Figures 9 and 10.

In Figures 9 and 10, the upper left window box of roto viewer 22 is designated by the numeral 23. The upper right window box is designated by the numeral 24. The screen captures of Figures 9 and 10 illustrate examples of radiology images that can be displayed using the method and apparatus of the present invention.

As shown in Figure 10, the roto viewer 22 can include different groups of images in each of the window boxes 23, 24, 25 or 26. In Figure 10, the window 23 contains those images which are displayed in the left hand computer monitor 20. The window box 24 of roto viewer 22 contains images which are displayed in the right hand monitor 21 in Figure 10. Other images can be contained in other window boxes of the roto viewer 22 as shown in Figure 10, just below window boxes 23, 24. Each of these images 33, 34 appear in the roto viewer window boxes 23, 24. The roto viewer 22 can be moved about the screen by dragging it.

In Figure 11, the zoom feature of the present invention is illustrated. Each of the screens 20, 21 display a zoomed image. The monitor 20 displays image 36. The monitor 21 displays image 39. At the lower left hand corner of each of the screens 20, 21, there is provided a picture in a picture display. This picture in a picture display includes the smaller picture 35 showing a chest x-ray as an example. The viewing area 37 represents that portion of the chest x-ray 35 that is to be displayed in zoom format as image 36 in Figure 11. Similarly, the monitor 21 displays at its lower left hand corner a picture in picture 38 having viewing area 40 that designates the zoom area of the chest x-ray 38. The image 39 is that portion of the image contained within viewing area 40 and which has been enlarged to fill substantially all of screen 21.

Figure 12 illustrates monitors 20, 21 with the roto viewer 22 removed.

In Figure 13, the group of windows 27, 28, 29 and 30 represent different cine sets or groups of images that have been purposely grouped together by the radiologist. Each of the

windows 27-30 can be moved about within the roto viewer to move the displayed images around the screens 20, 21.

## PARTS LIST

Part No.	Description
10	folder
11	hyperlink (ultrasound)
12	hyperlink (report)
13	report display area
14	report
15	audio hyperlink
16	graphical display - audio
17	ultrasound header
18	modality subfolder
19	hyperlink
20	left monitor
21	right monitor
22	roto viewer
23	left window box
24	right window box
25	windows/roto viewer
26	windows/roto viewer
27	windows group
28	windows group
29	windows group
30	windows group
31	left image/current PA
32	right image/current lateral
33	left image/current PA
34	right image/most recent lateral
35	picture in picture
36	image - zoom

37 view area  
38 picture in picture  
39 image - zoom  
40 view area

The foregoing embodiments are presented by way of example only; the scope of the present invention is to be limited only by the following claims.